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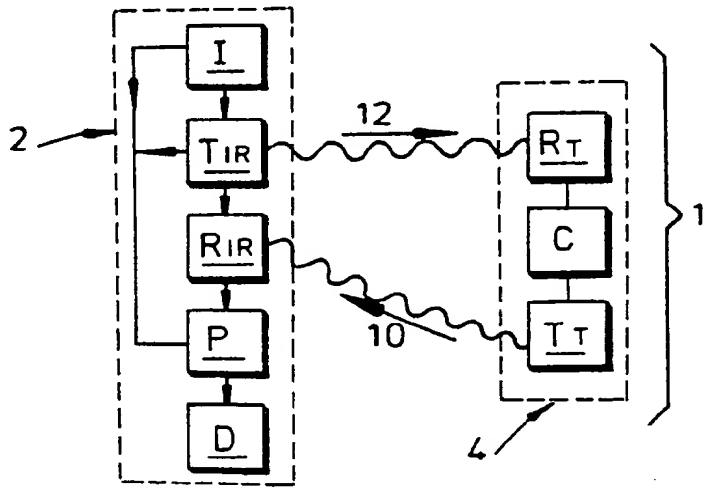

(57) Abstract

The present invention provides a range-finder system (1) suitable for use by golfers, surveyors, planners and others who need to determine the distance between themselves (24) and a remote position (6). The system comprises a transponder unit (4) disposable, at the remote position, and a portable interrogator responser unit (2). The transponder unit (4) comprises a transponder receiving means *Rt* for receiving incoming interrogation signals (12) and converting said signals into an appropriate form, and a comparator means *C* for comparing said received interrogation signal (12) with a preset signal and transmitting means *Tr* for transmitting a response signal (10) when said comparator *C* finds a received interrogation signal (12) the same as said preset signal. The interrogator responser unit (2) comprises input means *I* for inputting an interrogation command corresponding to a said interrogation signal (12) with preset signal; transmitter means *Tir* for transmitting an interrogation signal (12); a responser receiving means *Rir*; signal processing means *P*; and output means *D*, for receiving said response signal (10), and processing said response signal (10) so as to provide and display an output signal (17) corresponding to the distance of the responding transponder unit (4).

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RANGE-FINDER SYSTEM

The present invention relates to a system of determining accurately the distance from a first position to a second position without moving from said first position for golfers and surveyors but not exclusively.

The present methods used to determine distances vary widely. For many club golfers a rough guess at a distance is often used with variable results, however familiarity with a particular course or courses can allow players with good local knowledge to make more accurate decisions as to the distance to play and therefore assist in their choice of golf club to use.

Whilst most golf holes have distance markers on the tee, these can often be wildly inaccurate due to the fact that the positions of the tee and/or the flag on the green are frequently moved and can make the actual distance between the tee and the flag greater or less than the marker indicates.

Professional golfers rely on experience and on their caddies to advise them on distance and club. Caddies will pace a course prior to the playing of a professional game and make notes of distances with reference to bunkers, natural landmarks and the like, this information is then made available to the player at any point on a specific hole so that he can choose the correct club for distance. The big prize monies now available has put greater pressure on caddies to accurately advise distances, since a mistake can be very expensive.

Surveyors when surveying building sites, transportation route construction sites or greenfield sites for development for example require to know accurately the distance between a plurality of points such as boundaries and the like. Present methods of surveying distances include on the one hand measuring tapes which are time consuming and suitable only for relatively short

distances and on the other hand more sophisticated systems e.g. employing lasers and reflectors which are however relatively complex and expensive, requiring careful alignment of the reflectors etc.

It is an object of the present invention to make available a system for surveyors and/or golfers whether professional or club players whereby distances can be accurately determined and one or more of the above disadvantages avoided or minimised.

The present invention seeks to provide a range-finder system suitable for use by golfers, surveyors, planners and others who need to determine the distance between themselves and a remote position, which system comprises a transponder unit disposable, in use, at said remote position, and a portable interrogator responser unit, wherein said transponder unit comprises a transponder receiving means formed and arranged for receiving incoming interrogation signals and converting said signals into an appropriate form, and transmitting means formed and arranged to transmit a response signal when said transponder receives a said interrogation signal, and wherein said interrogator responser unit comprises input means formed and arranged for inputting an interrogation command corresponding to a said interrogation signal, and transmitter means formed and arranged for transmitting an interrogation signal in response to inputting of said interrogation command, said interrogator responser further including a responser receiving means, signal processing means and output means formed and arranged for receiving said response signal, and processing said response signal so as to provide an output signal corresponding to the distance of the responding transponder unit, whereby in use of the system to measure the range of a desired transponder unit, inputting of a corresponding interrogation command to the interrogator responser unit causes said interrogator responser unit to transmit a

predetermined interrogator signal which the transponder unit will receive and will respond to said interrogator signal, by transmitting a response signal, which response signal is received and processed at said interrogator responser so as to provide an output signal corresponding to the range of said desired transponder unit.

In the case of golfing applications there will normally be used 18 transponder units, whilst in the case of surveying applications there may be used from 1 to 10, conveniently from 2 to 8, preferably from 3 to 6 transponder units.

In a preferred aspect therefore the present invention provides a range-finder system suitable for use by golfers, surveyors, planners and others who need to determine the distance between themselves and various remote positions which system comprises a plurality of transponder units disposable, in use, at various positions in spaced apart relation and a portable interrogator responser unit, wherein said transponder unit comprises a transponder receiving means formed and arranged for receiving incoming interrogation signals and converting said signals into an appropriate form, and a comparator means in the transponder unit for comparing said received interrogation signal with a preset signal and transmitting means formed and arranged to transmit a response signal when said comparator finds a received interrogation signal corresponding to said preset signal, and wherein said interrogator responser unit comprises input means formed and arranged for inputting of a plurality of different interrogation commands corresponding to respective ones of said plurality of transponder units and transmitter means formed and arranged for transmitting respective ones of a plurality of different interrogation signals in response to inputting of said interrogation commands, said interrogator responser further including a responser receiving means, signal processing means and output means

formed and arranged for receiving said response signal, and processing said response signal so as to provide an output signal corresponding to the distance of the responding transponder unit, whereby in use of the device to measure the range of a desired transponder unit, inputting of a corresponding interrogation command to the interrogator responser unit causes said interrogator responser unit to transmit a predetermined interrogator signal which all transponder units receive but only said desired transponder unit will respond to said interrogator signal, by transmitting a response signal, which response signal is received and processed at said interrogator responser so as to provide an output signal corresponding to the range of said desired transponder unit.

Thus with a golf range-finder system of the invention, golfers may readily determine, through the pressing of a button, the distance from their position, beside their ball, to the green they wish to hit, thereby enabling the golfer to choose the correct club for the displayed distance. Surveyors, planners or the like may also readily determine the distances between a responser unit and a plurality of points each provided with a said respective transponder unit in a fast, efficient and accurate manner.

In another aspect the invention provides a method available to referees of golf matches whereby said referee can, through use of the golf range-finder system of the invention, can adjudicate as to which player is furthest away from the flag and hence, according to the rules and etiquette of golf, which player is to play first.

In a further aspect the invention provides an installation of golf range-finder systems to golf courses whereby a golfer having an interrogator responser of the invention can use said interrogator responser unit on any golf course installed with transponder units of the invention attached to each flag on the course, wherein all

golf course holes numbered one (1), for instance, respond to the same interrogator signal and all golf course holes numbered two (2) respond to, another preset interrogator signal and so on, thereby enabling a golfer on an unfamiliar golf course to make a more confident choice of golf club for a particular length of shot.

Advantageously the range of receiving and/or transmitting of the invention is not generally greater than the distance a good golfer may be expected to achieve on a tee shot, for instance around 300 yards (approximately 274 m) thereby minimising the power and cost of the hardware of the invention and also conveniently preventing two holes being mixed up for instance where two golf courses are in close proximity to each other.

Conveniently the distance is displayed by an L.C.D. (Liquid Crystal Display) or L.E.D. (Light Emitting Diode) display on the interrogator responser which is easily readable. Desirably the mode of display may be convertible from imperial measurement (i.e. yards/feet) to S.I. units (metres). Alternatively an audible output may be used such as a microchip controlled synthesized voice.

The L.C.D. display and operating controls of the interrogator responser means are advantageously housed in a hand held portable container that is waterproof and shockproof. The interrogator responser means may also have therein incorporated a clock and timekeeping device as well as an electronic scorecard. Conveniently the input means may be in the form of a plurality of individual dedicated switch means e.g. push buttons or touch sensitive pads.

Alternatively the input means may comprise a selector means such as a slide or rotary control or an alpha and/or numeric keypad used together with a 'transmit' or similar switch means to operate the interrogator.

The interrogation signals may be transmitted, compared

and received in any known manner including pulse coding by frequency modulation and/or amplitude as well as frequency length of light, sound or radio waves.Thus various forms of interrogation and response signals may be used in accordance with the present invention including both sound and electromagnetic radiation signals from various parts of the frequency spectra. Thus there may be used audible or ultrasonic sound waves, and radio waves especially those in the VHF or UHF range.

It will be understood though that signals in different frequency bands have different propagation characteristics so that higher power transmitting may be required for the required operating ranges which generally may be up to around 500 metres, for example from 20 to 300 metres. Also different forms of signal may be more or less susceptible to interference from ambient signal noise and/or weather conditions. In general it has been found advantageous in relation to simplicity and economy of construction and having regard also to the above criteria, to utilise a sound wave interrogation signal and radio frequency (R.F.) electromagnetic radiation response signals. Suitable sound wave signals may be in the audible range or ultrasonic range, and conveniently may be in the range from 1 to 2 KHz. In the latter case an audio signal transmitter having an output power of the order of 1 to 2 watts would normally provide an adequate range. Suitable R.F. signals may be in the VHF or UHF bands and conveniently are in the VHF range from 150 to 300 MHz, preferably from 220 to 260 MHz. In the latter case R.F. signal transmitters having an output power of the order of 10 mW. would normally provide an adequate range. Audio and R.F. signal transmitters and receivers suitable for use in the range-finder of the present invention are well known and readily available and accordingly will not be described in detail.

In another aspect the invention provides a method of

measuring the distance a golf ball is hit, by using a further function of the interrogation responser, whereby the display is zeroed to indicate a datum prior to a shot, the player then plays a shot and moves to the new ball position and the interrogator responser unit's processor means can process the distance, with reference to the datum and the desired transponder unit, the golfer has approached.

In yet another aspect the invention enables the golfer to know, through practice, the distance he can achieve with different respective clubs thereby facilitating correct golf club selection on the golf course.

It will be appreciated that a power source is of course necessary to operate the system. Advantageously compact light weight batteries and/or rechargable batteries are used but more conveniently solar charged cells for each transponder unit and for the interrogator responsers unit are used as golf is generally played in reasonably good ambient light conditions suitable for the application of solar cells.

Further preferred features and advantages of the present invention will appear from the following detailed description given by way of example of a preferred embodiment relating in particular to a golfing application illustrated with reference to the accompanying drawings in which:-

Fig.1 is a plan view of two holes on a golf course showing the principle of the range-finder system of the invention in use;

Fig.2 is a front view of the keyboard and digital display unit of the portable interrogator responser unit of the range-finder system of the invention;

Fig.3 is a schematical representation of the main components of the range-finder system of the invention; and

Fig.4 is a a more detailed schematic representation of the main components of a system similar to that of Fig.3.

With reference to Fig.1., a range-finder system, generally indicated by reference number 1, is shown in use on two holes 3, 5 on a golf course 8 (only two are shown in the interests of clarity). The system 1 comprises two main components - the interrogator responser unit 2 and the transponder unit 4 (Not shown as it is essentially a discrete black box). A transponder unit 4 is attached to the top of each of the flags 6, on the golf course 8, each transponder unit 4 being coded so that it only responds and transmits a signal 10 when it receives the correct interrogation signal 12 from the interrogator responser unit 2. Said interrogator responser unit 2 will be described in more detail with reference to Fig.2 and Fig. 3.

Fig. 2 shows a preferred embodiment of the interrogation responser unit 2 of the invention. The unit 2 is a portable, hand-held, piece of equipment similar in size and design to a modern cellular telephone. The unit 2 comprises a rectangular casing 14 on one face of which is an LCD display screen 16 and a plurality of push buttons 18 and an ON/OFF switch 20. The unit 2 also comprises an aerial 22 for receiving and transmitting signals 10, 12 as will be described in greater detail.

Fig. 3 shows a schematical layout of the main components of the invention. The interrogator responser 2 comprises an input unit I corresponding to the push buttons 18 and the ON/OFF switch 20 in Fig.2, a transmitter Tir, a receiver Rir, a processor P and a display unit D corresponding to the LCD display screen 16 in Fig. 2.

The transponder unit 4 comprises a receiver Rt for receiving interrogation signals 12 from the interrogator responser unit 2 and a transmitter Tt for transmitting response signals 10 and a comparator C for the comparison of interrogation signals 12, wherein said signal is a pulsed code or any other suitable signal.

In use of the range-finder system 1 of the invention a golfer 24 (Fig.1) holding the interrogator responser unit 2 would program the unit 2 by indicating which hole number was required, using the push button 30 on the unit 2, then by pointing said unit 2 generally in the direction of the desired flag 6, corresponding to the hole number programmed, the distance button 26 is pressed (Fig.2) and an interrogator signal 12 is transmitted out towards the flag 6, which if the signal 12 matches that preset within its comparator C, a transponder response signal 10 is transmitted back to the interrogator responser unit 2 which processes the time delay between transmission and reception of the two respective signals 10, 12, and displays the distance to the flag 6 on the LCD screen 16, thereby allowing the golfer 24 to choose the correct club for distance.

With reference to Fig.3 the operation of the invention will now be described in greater detail.

Switching the unit 2 on and programming a hole number through the input unit I and pressing the distance button 26 (Fig.2) causes the transmitter Tir to transmit an interrogator signal 12 that will be received by the receiving unit Rt of all the transponders units 4 in close proximity to the interrogator unit 2 transmitting said signal 12, however only that comparator unit C which can compare the similarity of the transmitted interrogation signal 12 with a preset signal in said comparator C will respond by transmitting, by transmitter unit Tt, a transponder response signal 10 which is received by the interrogator responser's 2 receiver unit Rir. Said receiver unit Rir transfers the received signal 10 into digital impulses which are processed in conjunction with any digital impulses from the transmitter Tir and/or the input I by the processor P to determine the time delay between transmission of the interrogator responser units 2 interrogation signal 12 and reception of the transponder

unit's 4 response signal 10 taking into account the transponder unit's 4 comparator C turnaround time, the processor P can calculate the distance between said interrogator responser unit 2 and said transponder unit 4 (i.e. the flag 6) and display said distance on said display unit D.

The processor unit P and the input unit I of the interrogator responser unit 2 are formed and arranged so that a distance displayed on the LCD screen 16 in metres can be readily changed to yards and vice versa by pressing one button 28 (Fig.2). A variety of other push buttons 18 are available on the interrogator responser unit 2 for functions such as time, elapsed time, score etc. which information is readily processed and displayed by said processor P and said display D respectively.

Various modifications can be made to the embodiment hereinbefore described without departing from the scope of the present invention. Memory cards may be made available for specific golf courses, which can be interchangeable in the interrogator responser thereby providing additional information about the golf course such as the distance to obstacles such as bunkers.

Fig.4 shows in more detail an embodiment of the invention in which is used a sonic link from the interrogator responser unit and a VHF radio link from the transponder unit back to the interrogator responser unit. In Fig. 4 like parts corresponding to those in Figs. 1 to 3 have been identified by like reference indicia. In this case the handheld interrogator responser unit 2 has an input keyboard 18 connected to a microcontroller circuit 36 which is connected in turn via a timing circuit 38 to a power amplifier 40 for driving a speaker 42 so as to emit interrogation signals in the form of sound pulses.

The interrogation signals 12 are picked up at the pole-mounted transponder unit 4 by a microphone 44 and amplified via a preamplifier 46 and main amplifier 48 and

separated from background noise by suitable selective filter means 50 conveniently formed and arranged to pass only signals corresponding to those transmitted by the interrogator responser unit 2. A comparator 56 then compares the filtered signal with a stored preset signal and upon detection of an interrogation signal corresponding thereto activates a low power (ca. 10 mW) VHF radio transmitter 58 to transmit via a suitable VHF aerial 60 a VHF radio response signal 10 of predetermined frequency in the form of pulses. It will be appreciated though that the comparator could be omitted where only a single transponder unit 4 is in use and/or where different interrogation signal frequencies are used for different transponder units and/or where different transponder units transmit at different frequencies and the interrogator responser unit 2 is formed and arranged to discriminate between transponder units responding simultaneously at different frequencies (see below).

The response signal pulses 10 are picked up at the interrogator responser unit 2 by a VHF radio receiver 62 provided with a suitable VHF aerial 22 which then passes on input pulses to the timing circuit 38 which then measures the time delay between corresponding output interrogation sound signal pulses and input radio signal response signal pulses. The delay is then converted via the microcontroller circuit 36 into distance measurements which can be displayed immediately on the visual display means 16 and (or temporarily stored in a memory means (e.g. RAM or E^2PROM) for subsequent transmission via a suitable interface 64 (conveniently RS232) to a computer means 66 for further processing. Alternatively the distance measurements could be immediately transmitted to such computer means 66 without first being stored.

Where two or more transponder units 4 are in use then the microcontroller circuit 36 may be connected to the radio receiver 62 to select the frequency to which the

receiver is tuned to pick-up response signals 10 from only a desired transponder unit 4, individual transponder units 4 being provided with radio transmitters 58 transmitting on different frequencies. Alternatively the individual transponder units 4 could have their comparator means 56 programmed with different preset signals so that the radio transmitter 58 is only activated when an interrogation signal 12 corresponding to that particular transponder is received individual transponder unit transmitters 58 transmitting on the same frequency if desired. Of course if desired then both the transponder and interrogator responser units could be provided with selection means for discriminating between different transponder units.

The system used in surveying applications will be generally similar to those described above except that the number of transponder units will generally be much smaller (and indeed may be only one) whereby the arrangements for discriminating between different transponder units will be reduced. Also whilst an accuracy of the order of $\pm$1m will generally be adequate for golfing applications, the apparatus is desirably formed and arranged to have an accuracy of at least $\pm$5cm, preferably at least $\pm$1cm, in 100m for surveying applications. In order to facilitate accurate measurement the interrogator responser unit is provided with a tripod mounting fitting for mounting of said unit onto a surveying tripod or the like in use.

CLAIMS

1. A range-finder system (1) suitable for use by golfers, surveyors, planners and others who need to determine the distance between themselves (24) and a remote position (6), which system comprises a transponder unit (4) disposable, in use, at said remote position , and a portable interrogator responser unit (2), wherein said transponder unit (4) comprises a transponder receiving means (Rt) formed and arranged for receiving incoming interrogation signals (12) and converting said signals into an appropriate form, and transmitting means (Tt) formed and arranged to transmit a response signal (10), when said transponder receives a said interrogation signal (12), and wherein said interrogator responser unit (2) comprises input means (T) formed and arranged for inputting an interrogation command corresponding to a said interrogation signal (12), and transmitter means (Tir) formed and arranged for transmitting an interrogation signal (12) in response to inputting of said interrogation command, said interrogator responser further including a responser receiving means (Rir), signal processing means (R) and output means (D) formed and arranged for receiving said response signal (10), and processing said response signal (10) so as to provide and display an output signal corresponding to the distance of the responding transponder unit (4), whereby in use of the system (1) to measure the range of a desired transponder unit, inputting of a corresponding interrogation command to the interrogator responser unit (2) causes said interrogator responser unit (2) to transmit a predetermined interrogator (12) signal which the transponder unit (4) will receive and will respond to said interrogator signal (12), by transmitting a response signal (10), which response signal (10) is received and processed at said interrogator responser unit (2) so as to provide an output signal (17) corresponding to the range of said desired

transponder unit (4).

2.A system according to claim 1 which includes a plurality of transponder units (4) disposable at various remote positions (6), wherein said interrogation responser unit (2) has input means (I) formed and arranged for inputting of a plurality of different interrogation commands corresponding to respective ones of said plurality of transponder units (4) and the transmitter means (Tir) is formed and arranged for transmitting respective interrogation signals (12), and said transponder units (4) are formed and arranged for selectively detecting respective interrogation signals (12) and transmitting response signals (10) only upon receipt of respective interrogation signals (12).

3. A system according to claim 2 wherein the transponder units include comparator means (C) for comparing received interrogation signals with a preset signal and the transmitter means (Rt) is formed and arranged for transmitting a response signal (10) only upon receipt of an interrogation signal (12) corresponding to said preset signal.

4. A system according to claim 2 wherein the transponder units (4) include selective filter means (50) formed and arranged for selectively passing only received interrogation signals (12) corresponding to that particular transponder unit (4) and the transmitter means (Rt) is formed and arranged for transmitting a response signal (10) only upon receipt of an interrogation signal (12) passed by the selective filter means (50) of that particular transponder unit (4).

5. A system according to any one of claims 1 to 4 wherein the transponder unit transmitter means (Tr) of each transponder unit is formed and arranged for transmitting a different response signal (10) and the interrogator responser unit (2) includes discriminator means for selectively receiving and/or passing response

signals (10) only from a respective said transponder unit (4).

6. A range-finder system suitable for use by golfers, surveyors, planners and others who need to determine the distance between themselves (24) and various remote positions (6) which system comprises a plurality of transponder units (4) disposable, in use, at various positions in spaced apart relation and a portable interrogator responser unit (2), wherein said transponder unit (4) comprises a transponder receiving means (Rt) formed and arranged for receiving incoming interrogation signals (12) and converting said signals into an appropriate form, and a comparator (C) means in the transponder unit (4) for comparing said received interrogation signal (12) with a preset signal and transmitting means (Tr) formed and arranged to transmit a response signal (10) when said comparator (C) finds a received interrogation signal (12) corresponding to said preset signal, and wherein said interrogator responser unit (2) comprises input means (I) formed and arranged for inputting of a plurality of different interrogation commands corresponding to respective ones of said plurality of transponder units (4) and transmitter means (Tir) formed and arranged for transmitting respective ones of a plurality of different interrogation (12) signals in response to inputting of said interrogation commands, said interrogator responser unit (2) further including a responser receiving means (Rir), signal processing means (P) and output means (D) formed and arranged for receiving said response signal (10), and processing said response signal (10) so as to provide an output signal (17) corresponding to the distance of the responding transponder unit (4), whereby in use of the device to measure the range of a desired transponder unit, inputting of a corresponding interrogation command to the interrogator responser unit (2) causes said interrogator

responser unit (2) to transmit a predetermined interrogator signal (12) which all transponder units (4) receive but only said desired transponder unit will respond to said interrogator signal (12), by transmitting a response signal (10), which response signal (10) is received and processed at said interrogator responser unit (2) so as to provide an output signal (17) corresponding to the range of said desired transponder unit (4).

7. A system according to any one of claims 1 to 6 wherein the or each said transponder unit (4) is mounted on or in a surveying or golf flag pole.

8. A system according to any one of claims 1 to 7 which includes 18 transponder units (4) having comparator means (C) formed and arranged for comparing incoming interrogation signals (12) with different respective preset signals.

9. A system according to any one of claims 1 to 8 which includes from 2 to 10 transponder units (4) having comparator means (C) formed and arranged for comparing incoming interrogation signals (12) with different respective preset signals.

10. A system according to any one of claims 1 to 9 wherein the interrogator responser unit transmitter means (Tir) is formed and arranged for sending a sound wave interrogation signal (12) and said transponder unit receiving means (Rt) is formed and arranged for receiving a said sound wave interrogation signal (12) and converting it into an electrical signal for comparison by said comparator means (C) with the preset signal.

11. A system according to claim 10 wherein said transmitter means Tir is formed and arranged to send an interrogation signal (12) having a frequency of from 1 to 2 kHz.

12. A system according to any one of claims 1 to 11 wherein the transponder transmitting means (Tt) is formed and arranged for transmitting a radio wave response signal

(10).

13. A system according to claim 12 wherein the transponder transmitting means Tt is formed and arranged for transmitting a VHF or UHF radio wave response signal (10).

14 A system according to claim 13 wherein the transponder transmitting means (Tt) is formed and arranged for transmitting a VHF radio wave response signal (10) having a frequency of from 150 to 300 MHz.

14. A system according to any one of claims 1 to 13 wherein the interrogator responser unit (2) includes a plurality of digitally operable switch means (18) formed and arranged for selecting and transmitting an interrogation signal (12) corresponding to the transponder unit preset signal at the desired said remote position (6).

15. A system according to any one of claims 1 to 14 wherein the interrogator responser unit (2) includes an alpha- and/or numeric visual display means (16).

16. A system according to any one of claims 1 to 15 wherein interrogator responser unit (2) includes an erasable memory means (32) for logging a plurality of individual distance measurements.

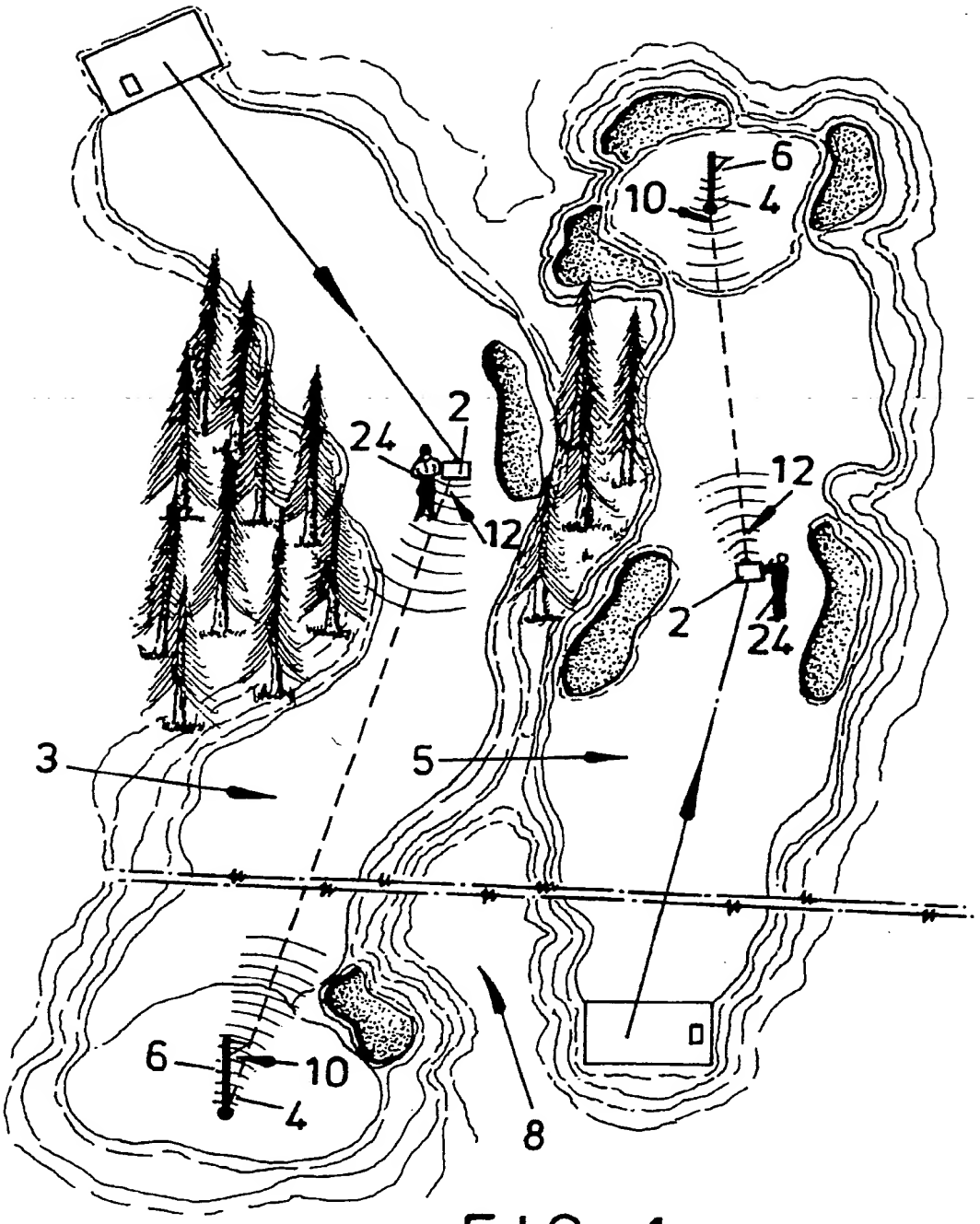

FIG. 1

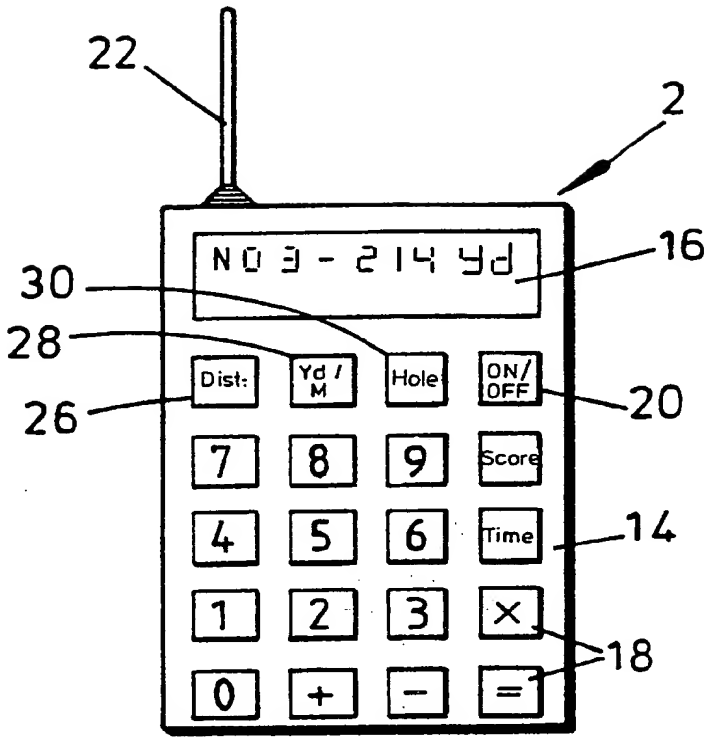

FIG. 2

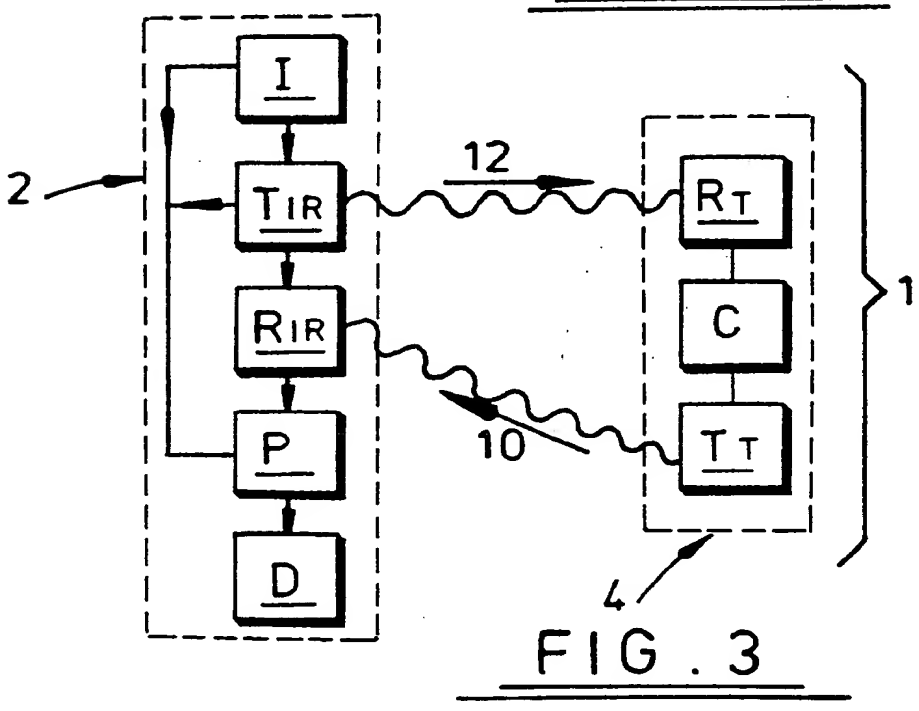

FIG. 3

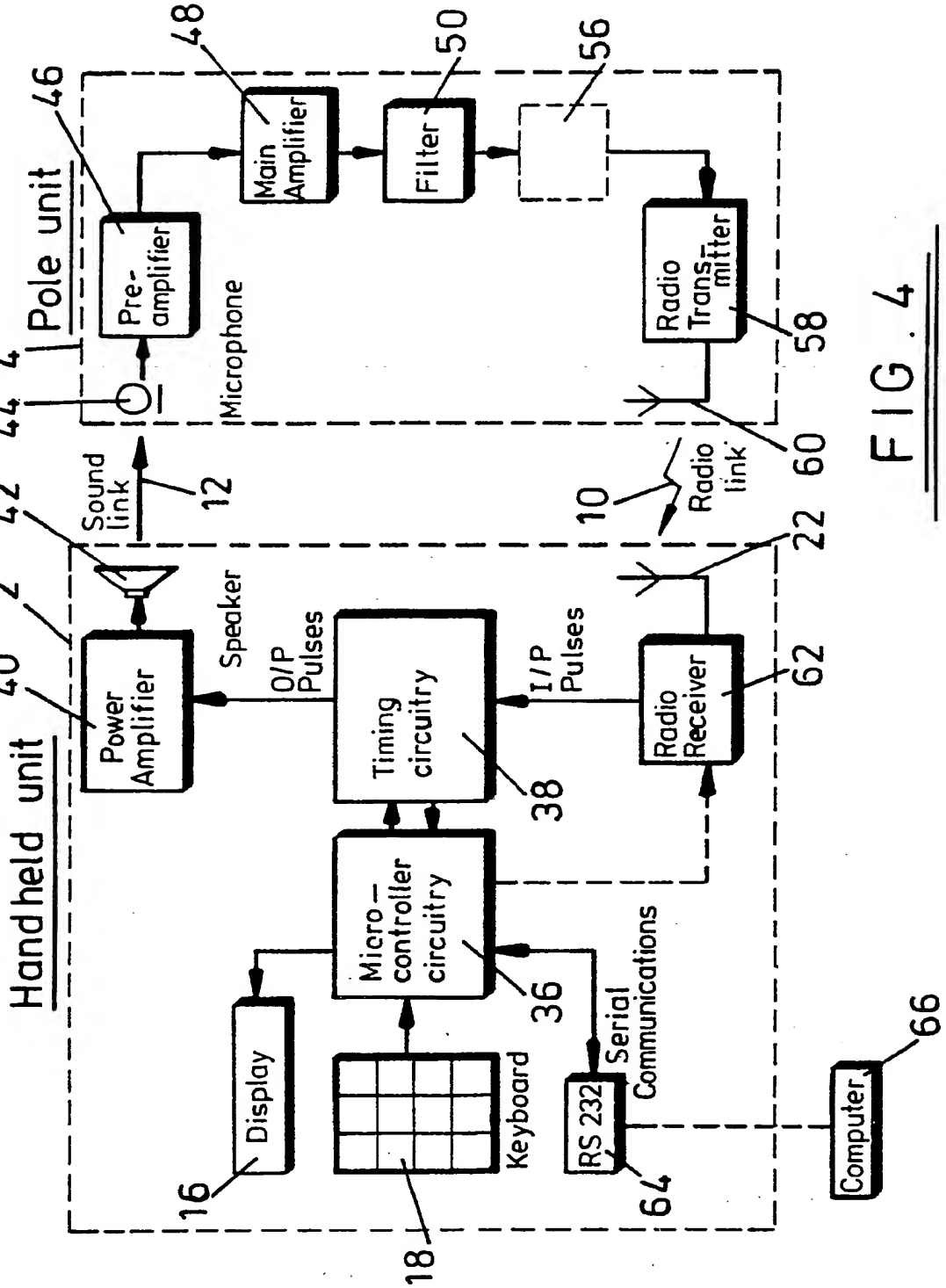

FIG. 4

SUBSTITUTE SHEET

INTERNATIONAL SEARCH REPORT

International Application N. PCT/GB 91/00061

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 G01S13/78 ; G01S15/74 ; A63B57/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	G01S ; A63B ; A61B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No.[13]
X	US,A,4297701 (HENRIQUES) 27 October 1981 see column 1, line 51 - column 3, line 68 see column 8, line 37 - column 9, line 40; figures 1-2	1-9, 12-17
X	US,A,4136394 (JONES ET AL.) 23 January 1979 see column 1, line 63 - column 2, line 47 see column 3, line 12 - column 4, line 61; figures 1-3	1, 10-11
X	US,A,4698781 (COCKERELL,JR) 06 October 1987 see the whole document	1, 12, 16, 17
A	US,A,3868692 (WOODARD ET AL.) 25 February 1975 see column 1, line 41 - column 2, line 50; figure 1	1, 6

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* Special categories of cited documents : [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
03 APRIL 1991	23.04.91
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	AUGARDE E.P.G.T.

Form PCT/ISA/210 (second sheet) (January 1985)

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	EDN ELECTRICAL DESIGN NEWS. vol. 32, no. 18, September 1987, NEWTON, MASSACHUSETT pages 137 - 150; D. SHEAR: "Design and build a transponder using DSP tools" see page 138, inset; figure 1 ---	3-4, 8-10
A	US,A,4777329 (MALLICOAT) 11 October 1988 see column 2, lines 19 - 34 ---	10, 12

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

GB 91/00061
SA 43513

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 03/04/91
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-4297701	27-10-81	None	
US-A-4136394	23-01-79	AU-A- 3973878	20-03-80
		GB-A- 2005021	11-04-79
		JP-A- 54059895	14-05-79
US-A-4698781	06-10-87	None	
US-A-3868692	25-02-75	None	
US-A-4777329	11-10-88	None	